



KATZEN

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**EXPLORING
THE PROSPECTS
for
ETHANOL
GENERATION 1.5**

DEFINING GENERATION 1.5

- Gen 1: sugar, starch (conventional)
 - Commercial technology (financeable)
- Gen 2: Lignocellulose
 - Technology not commercial

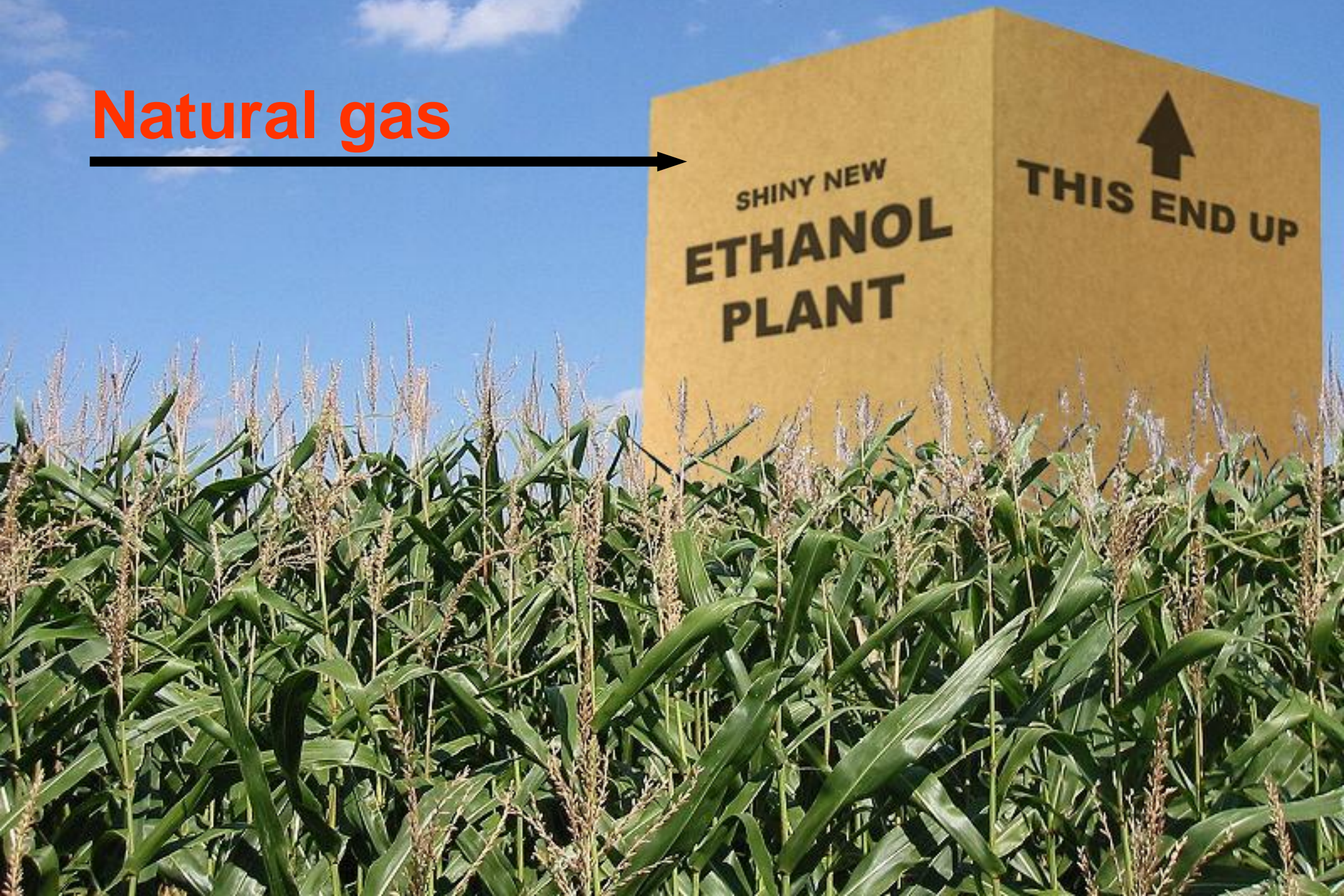
DEFINING GENERATION 1.5

- Gen 1: sugar, starch (conventional)
 - Commercial technology (financeable)
- Gen 1.5: sugar, starch (new sources)
 - Existing technology / ag integrations
- Gen 2: Lignocellulose
 - Technology not commercial

TODAY IN USA

**“SQUARE BOX
IN A CORNFIELD”**

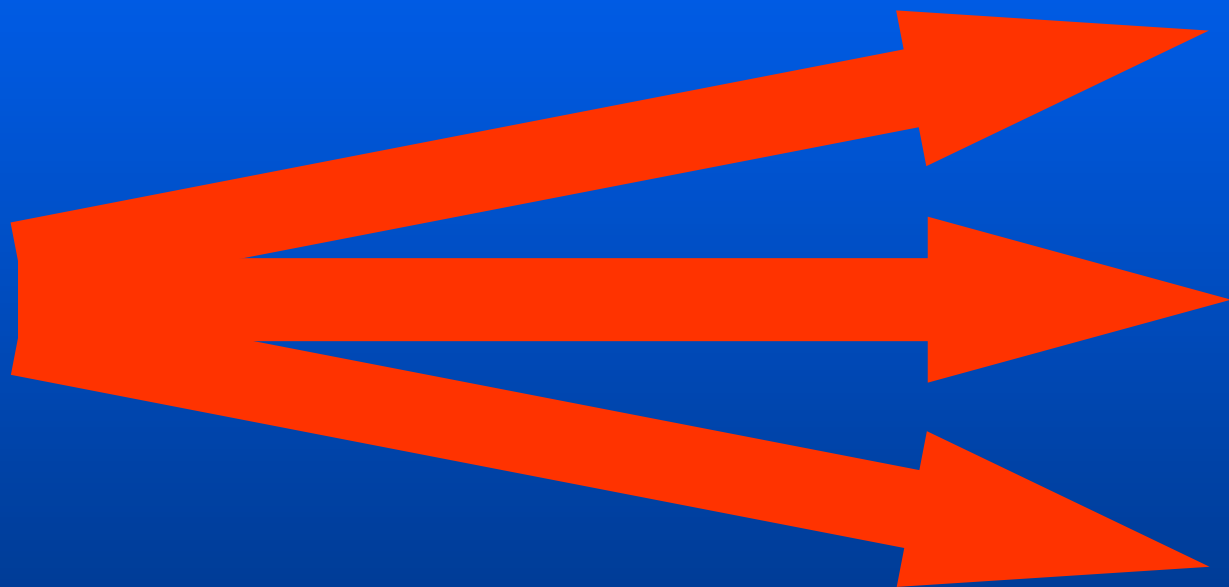
Natural gas



THE “SQUARE BOX” RISK

- COMMODITY CYCLES**

WORLD COMMODITY PRICES



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GENERATION 1.5

**Advancing the contribution of
agriculture in the
food/feed/fuel system**

AGENDA

- SMALL GRAINS AS FEEDSTOCK
- AGRICULTURAL INTEGRATION
- FUTURE FEEDSTOCKS
- TECHNOLOGY ASSESSMENT
- HOW CAN EVERYBODY WIN?

**DO MULTIPLE
FEEDSTOCKS
WORK
FOR ETHANOL?**

MULTIPLE FEEDSTOCKS

- **WHEAT**
- **BARLEY**
- **CORN**
- **MILO**
- **TRITICALE**

Abengoa Bioenergy Netherlands



BIOETANOL GALICIA



Agrana

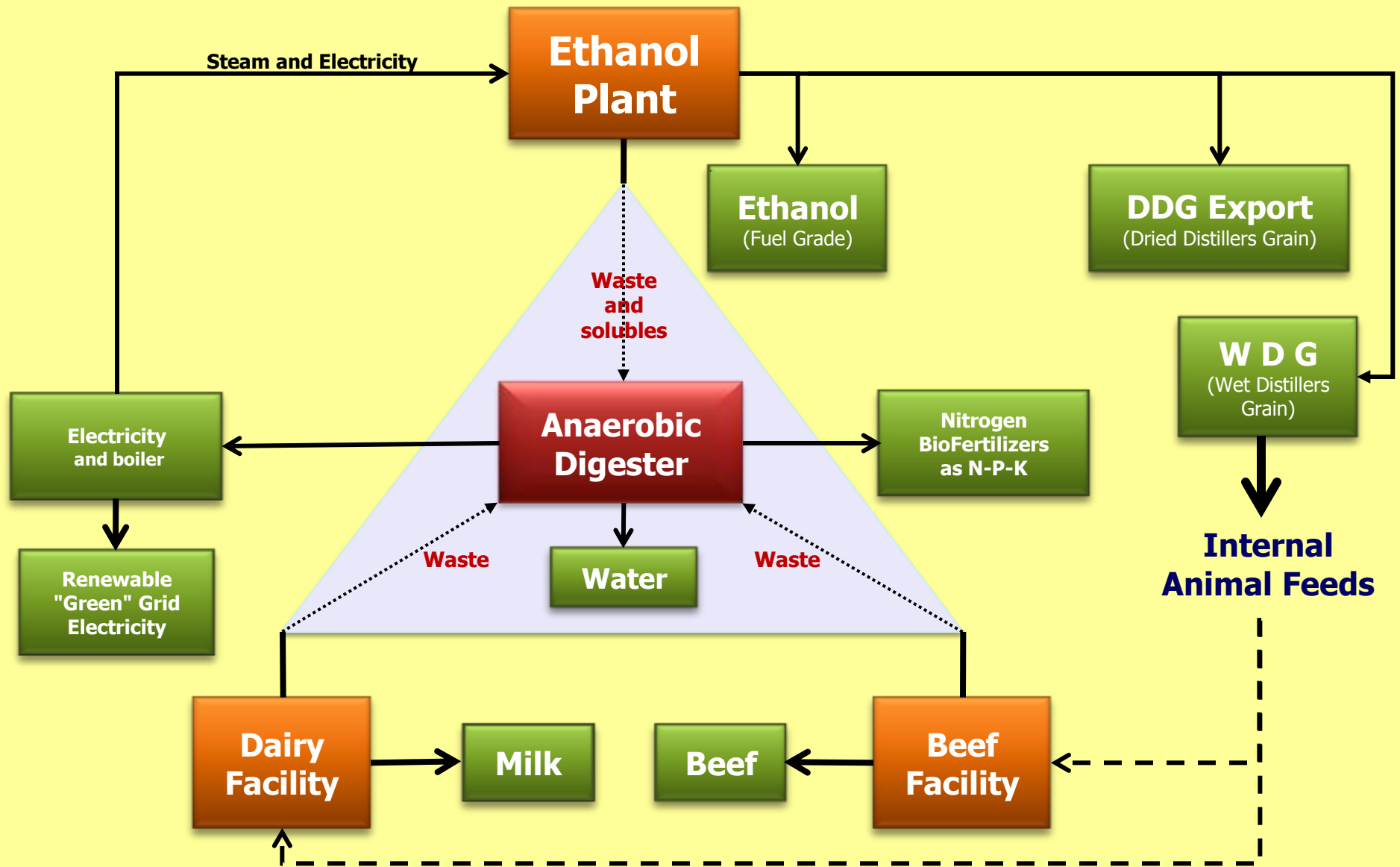


TARKIM



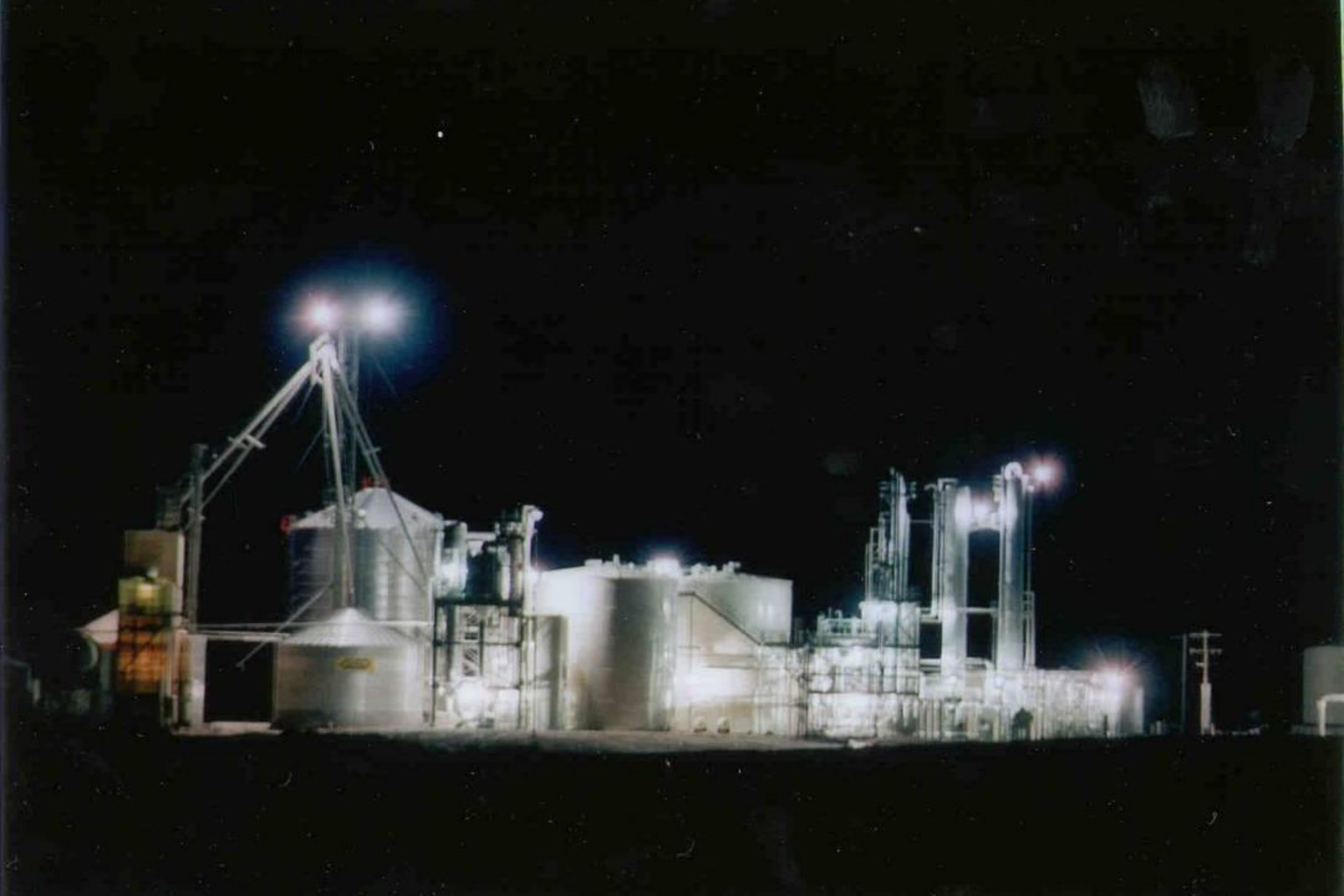
INTEGRATED AGRICULTURE

FOOD/FEED/FUEL



E³





REEVE AGRI-ENERGY



POUNDMAKER

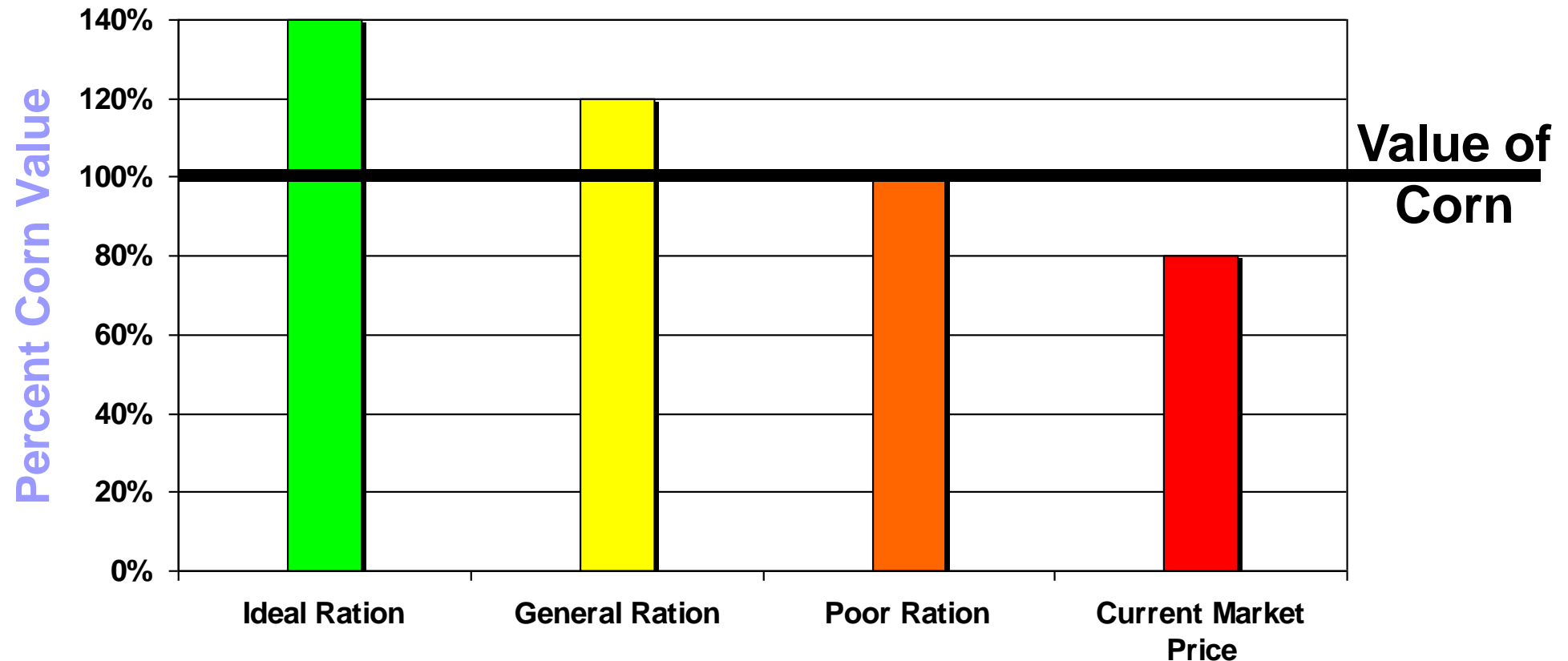


Animal Feed Coproducts

The Forgotten Value

previous. In fact, most animal sectors have seen a decline in overall numbers over the past industry has been the increase in export demand for distillers' grains. China has been one of the major markets as exports to that nation have increased rapidly. Last year 600,000 tons were exported to China and are expected to grow to as much as 2 million tons this year. There appears to be a large amount of competition in the market right now from other sources of protein. Soybean meal price for instance has fallen from \$312 per ton in December to \$251 per ton in early March on the May contract. DDG values have fallen to around 80% the value of corn in early April, but we are starting to see an increase in cattle on feed as a back log of cattle works into the system after January and February weather-related delays.

Animal Feed Coproducts Value



**Why do we worry about
the ethanol blend wall
and ignore
the feed wall?**

LIVESTOCK **THE PARTNER** **TO GRAIN ETHANOL**



**SO... IS THERE
MORE THAN JUST
SQUARE BOXES
IN CORNFIELDS?**

**SO... IS THERE
MORE THAN JUST
SQUARE BOXES
IN CORNFIELDS?**

YES!



ALTERNATIVE FEEDSTOCKS

SunSpuds™

SUGAR – Not Grain, Not Cellulose

TUBER – Proprietary Hybrid of Sunflower and Jerusalem
Artichoke

PERENNIAL – High Resistance, Low Input Agricultural
Crop

FARMING & STORAGE – Modified Potato Practice

SunSpuds Tubers



Ethanol Feedstocks

Comparison

| Crop Type | Ethanol Yield | Acres Required |
|-----------|---------------|----------------|
| Corn | 2.7 gal/bu | 76,000 |
| Wheat | 2.6 gal/bu | 92,000 |
| Potatoes | 1.2 gal/cwt | 62,000 |
| SunSpuds | 1.6 gal/cwt | 37,500 |

Basis: 30MM GPY



SWEET SORGHUM



SWEET POTATO



TECHNOLOGY ASSESSMENT

Is Corn the Bridge to Cellulose Ethanol?



OR

**Do we need a new paradigm
to secure the future?**

Generation 1.5

- Purpose-grown starch and sugar
- Small grains
- Biomass-fueled boilers
- Livestock integration

Is Corn Really the Bridge to Generation 1.5?



Advanced Biofuel

**We must
always remember...**

“ ALCOHOLISM ” IS A DISEASE

**“ VALUE - ADDED
AGRICULTURAL PROCESSING ”
IS A BUSINESS**



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